Docket 85963RLO
Customer No. 01333

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	Group Art Unit: 2879
Yuan-Sheng Tyan, *et al.*	Examiner: Elizabeth A. Rielley
WHITE-EMITTING MICROCAVITY OLED DEVICE	Serial No. 10/680,758
	Filed 07 October 2003

Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

REVISED APPEAL BRIEF PURSUANT TO 37 C.F.R. 41.37 AND 35 U.S.C. 134 AND RESPONSIVE TO NOTICE OF NON-COMPLIANT BRIEF

Sir:

A Notice of Non-compliant Brief was mailed July 31, 2006. Appellant hereby files this revised brief to address the points raised in the Notice. Appellant is appealing to the Board of Patent Appeals and Interferences from the Examiner's Final Rejection of claims 1-34 which was contained in the Office Action mailed February 7, 2006. A timely Notice of Appeal was filed on May 8, 2006, and the fee for filing of a brief was paid on July 7, 2006, when the original brief was filed. If any extension of time is needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136(a) and authorizes payment of any such extension fees to Deposit Account No. 05-0225.

TABLE OF CONTENTS

I. **REAL PARTY IN INTEREST** 1

II. **RELATED APPEALS AND INTERFERENCES** 1

III. **STATUS OF THE CLAIMS** 1

IV. **STATUS OF AMENDMENTS** 1

V. **BACKGROUND AND SUMMARY OF CLAIMED SUBJECT MATTER** 1

VI. **GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL** 5

VII. **ARGUMENTS** 6

- A. THE REJECTION OF CLAIMS 1-3, 5-10, 15-22, AND 27-32 UNDER 35 U.S.C. §103(A) AS BEING UNPATENTABLE OVER NAKAYAMA *ET AL.* (US PAT. NO. 5,847,506) IN VIEW OF DODABALAPUR *ET AL.* (US PAT. NO. 5,814,416). 6
  - *1. The examiner's stated case.* *6*
  - *2. Nakayama and Dodabalapur '416 do not teach the combination of a microcavity OLED device and a light-integrating element as presently claimed.* *6*
  - *3. Neither Nakayama nor Dodabalapur '416 produce white light.* *9*
- B. THE REJECTIONS OF CLAIMS 4, 11-14 AND 23-26 UNDER 35 U.S.C. §103(A) AS BEING UNPATENTABLE OVER NAKAYAMA *ET AL.* (US PAT. NO. 5,847,506) IN VIEW OF DODABALAPUR *ET AL.* (US PAT. NO. 5,814,416) AND FURTHER IN VIEW OF TOKITO *ET AL.* (US PAT. NO. 5,780,174). 9
  - *1. The examiner's stated case.* *9*
  - *2. Element 12 of Tokito is not a light-integrating element.* *10*
- C. THE REJECTION OF CLAIMS 33 AND 34 UNDER 35 U.S.C. §103(A) AS BEING UNPATENTABLE OVER NAKAYAMA *ET AL.* (US PAT. NO. 5,847,506) IN VIEW OF DODABALAPUR *ET AL.* (US PAT. NO. 5,814,416) AS APPLIED TO CLAIM 1 AND FURTHER IN VIEW OF DODABALAPUR *ET AL.* (US PAT. NO. 5,405,710). 10
  - *1. The examiner's stated case.* *10*
  - *2. Dodabalapur '710 fails to overcome the failure of Nakayama and Dodabalapur '416 to suggest a combination of a microcavity device and an integrating element as recited in all of the claims.* *11*

VIII. **SUMMARY** 11

IX. **CONCLUSION** 12

X. **APPENDIX I - CLAIMS ON APPEAL** 13

XI. **APPENDIX II - EVIDENCE** 19

XII. **APPENDIX III – RELATED PROCEEDINGS** 20

I. Real Party in Interest

The Eastman Kodak Company is the real party in interest, as evidenced by an assignment of record.

II. Related Appeals and Interferences

No appeals or interferences are known which will directly affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

III. Status of the Claims

Claims 1-34: Pending

Claims 1-34: Rejected

Claims 1-34: Appealed

Appendix I provides a clean, double spaced copy of the claims on appeal.

IV. Status of Amendments

No amendments to the claims were proposed following final rejection, and all claim amendments have been made of record and are reflected in the appendix of appealed claims.

V. Background and Summary of Claimed Subject Matter

Organic light emitting diode (OLED) devices are attractive because of their low driving voltage, high luminance, wide-angle viewing, and capability for full-color flat emission displays. Tang *et al.* described a multilayer OLED device in their U.S. Patents 4,769,292 and 4,885,211.[1]

Efficient white light producing OLED devices are considered low cost alternatives for several applications such as paper-thin light sources, backlights in LCD displays, automotive dome lights, and office lighting. White light producing OLED devices should be bright, efficient, and generally have a broad emission spectrum that covers most of the visible wavelength range. The term "white" or "substantially white" is used broadly by applicant to mean light that is perceived as white or off-white.[2]

---

[1] Specification at page 1, lines 20-23.

White light producing OLED devices have been reported before in U.S. Patent 5,683,823 wherein the luminescent layer includes red and blue light emitting materials uniformly dispersed in a host emitting material. This device has good electroluminescent characteristics, but the concentrations of the red and blue dopants are very small, such as 0.12% and 0.25% of the host material. These concentrations are difficult to control during large-scale manufacturing. JP 07,142,169 discloses an OLED device capable of emitting white light, made by forming a blue light emitting layer next to the hole-transporting layer and followed by a green light emitting layer having a region containing a red fluorescent layer.[3]

Kido *et al.*, in *Science*, Vol. 267, p. 1332 (1995) and in *Applied Physics Letters*, Vol. 64, p. 815 (1994), report a white light producing OLED device. In this device, three emitter layers with different carrier transport properties, each emitting blue, green, or red light, are used to generate white light. U.S. Patent 5,405,709 discloses another white emitting device, which is capable of emitting white light in response to hole-electron recombination, and comprises a fluorescent in a visible light range from bluish green to red. Deshpande *et al.*, in *Applied Physics Letters*, Vol. 75, p. 888 (1999), describe a white OLED device using red, blue, and green luminescent layers separated by a hole blocking layer.[4]

OLED devices typically have at least one transparent electrode, which is often fabricated from a conductive oxide such as indium-tin oxide (ITO). Such materials have sufficient conductivity for displays, in which the individual pixels are on the order of 1 mm or less. However, the conductivity of such transparent electrodes can be insufficient for applications with much larger individual emitting units, such as panel lighting. This disadvantage can be overcome by making the emitting elements in narrow stripes, but registration difficulties would make such a device more difficult to fabricate, increasing the manufacturing cost. Furthermore, such transparent electrodes are themselves costly and add to the manufacturing cost.[5]

---

[2] Specification at page 1, lines 24-30.
[3] Specification at page 2, lines 5-14.
[4] Specification at page 2, lines 15-24.

The present invention provides a white light emitting OLED apparatus that utilizes an OLED device having only metal electrodes for reduced cost, higher conductivity, and improved ease of manufacturing. The OLED apparatus provides improved performance.[6]

More particularly, the present invention provides a white OLED apparatus 100 with high illumination efficiency. According to the invention, a white light emitting OLED apparatus comprises a microcavity OLED device 10 and a light-integrating element 95, wherein the microcavity OLED device has a white light emitting organic EL element 70 and the microcavity OLED device is configured to have angular-dependent narrow-band emission, and the light-integrating element integrates the angular-dependent narrow-band emission from different angles from the microcavity OLED device to form white light emission.[7]

A first embodiment of a device according to the present invention is shown in Figure 1. The white OLED apparatus 100 includes an OLED device 10 and a separate light-integrating element 95. OLED device 10 includes at a minimum substrate 20, bottom electrode 30, commonly configured to be an anode, top electrode 90, commonly configured as a cathode, spaced from bottom electrode 30, and light emitting layer 50. The OLED device can also include one or more of a TIRF such as TIRF 25, transparent conductive spacer layer 35, hole-injecting layer 40, hole-transporting layer 45, electron-transporting layer 55, and electron-injecting layer 60. Hole-injecting layer 40, hole-transporting layer 45, light emitting layer 50, electron-transporting layer 55, and electron-injecting layer 60 comprise organic EL element 70.[8]

---

[5] Specification at page 2, line 25 to page 3, line 3.

[6] Specification at page 3, lines 15-18.

[7] Specification at page 3, lines 5-13, claim 1 (original) and Figures 1-3.

When EL emission is viewed through the substrate 20, bottom electrode 30 should be made of a reflective metal and should be thin enough so that it has a finite partial transmittance at the wavelength of the emitted light, referred to as being semitransparent. When EL emission is viewed through top electrode 90, bottom electrode 30 is preferably a reflective metal with a thickness that gives an optical density of 1.5 or higher so that it is essentially opaque and a fully reflective mirror.[9]

Claim 1 recites a white light emitting OLED apparatus comprising a microcavity OLED device and a light-integrating element, wherein the microcavity OLED device has a white light emitting organic EL element and the microcavity OLED device is configured to have angular-dependent narrow-band emission, and the light-integrating element integrates the angular-dependent narrow-band emission from different angles from the microcavity OLED device to form white light emission. Support for the language in claim 1 is found on page 3, lines 7-13.

Furthermore, the specification describes that:

> The term "OLED device" is used in its art-recognized meaning of a light emitting device comprising organic light emitting diodes. The term "OLED apparatus" is used to describe an apparatus that includes an OLED device as one of its key components. The term "white light" is used for a light that has a broad emission spectrum that covers most of the visible wavelengths and that is generally perceived by a user to have white color. The term "microcavity OLED device" is used to designate an OLED device that comprises an organic EL element disposed between two reflecting mirrors having over 30% reflectivity. In most cases, one of the reflecting mirrors is essentially opaque and the other one is semitransparent having an optical density less than 1.0. The two reflecting mirrors form a Fabry-Perot microcavity that strongly affects the emission characteristics of the OLED device. Emission near the wavelength corresponding to the resonance wavelength of the cavity is enhanced and those with other wavelengths are suppressed. The net

---

[8] Specification at page 10, lines 9-20.

[9] Specification at page 11, line 31 to page 12, line 19.

> result is a significant narrowing of the bandwidth of the emitted light and a significant enhancement of its intensity. The emission spectrum is also highly angular dependent. The term "organic EL element" refers to the one or more organic layers disposed between the two electrodes of an OLED device that emits light under applied voltage during the operation of the OLED device. For the purpose of this application, "organic EL element" can also include inorganic electron or hole-injecting layers if such layers are used in the OLED device.[10]

The microcavity structure significantly narrows the bandwidth of the emitted light. Even when a white light emitting organic EL element is used in the device, the output from the OLED device becomes narrow-banded. It is no longer useful as a white light emitting OLED device. The present invention recognizes the problem and also recognizes that the emission from a microcavity OLED device is highly angle dependent.[11] Thus, in accordance with the present invention, a white OLED apparatus is constructed by adding a light-integrating element to a microcavity OLED device to integrate the narrow-band emitted light from the microcavity OLED device at various angles into a single broadband emission with reduced angular dependence that can be perceived as white light.[12]

VI. Grounds of Rejection to be Reviewed on Appeal

The following issues are presented for review by the Board of Patent Appeals and Interferences:

1. The rejection of claims 1-3, 5-10, 15-22, and 27-32 under 35 U.S.C. §103(a) as being unpatentable over Nakayama *et al.* (US Pat. No. 5,847,506) in view of Dodabalapur *et al.* (US Pat. No. 5,814,416).

2. The rejections of claims 4, 11-14 and 23-26 under 35 U.S.C. §103(a) as being unpatentable over Nakayama *et al.* (US Pat. No. 5,847,506) in view of Dodabalapur *et al.* (US Pat. No. 5,814,416) and further in view of Tokito *et al.* (US Pat. No. 5,780,174).

---

[10] Specification at page 4, lines 11-31.
[11] Specification at page 5, lines 7-12.
[12] Specification at page 6, lines 1-5.

3. The rejection of claims 33 and 34 under 35 U.S.C. §103(a) as being unpatentable over Nakayama *et al.* (US Pat. No. 5,847,506) in view of Dodabalapur *et al.* (US Pat. No. 5,814,416) as applied to claim 1 and further in view of Dodabalapur *et al.* (US Pat. No. 5,405,710).

VII. Arguments

A. **The rejection of claims 1-3, 5-10, 15-22, and 27-32 under 35 U.S.C. §103(a) as being unpatentable over Nakayama *et al.* (US Pat. No. 5,847,506) in view of Dodabalapur *et al.* (US Pat. No. 5,814,416).**

1. The examiner's stated case.

The examiner urges that Nakayama *et al.* teaches a light emitting OLED apparatus comprising a microcavity OLED device and a light-integrating element, wherein the microcavity OLED device has a light emitting organic EL element. She admits that Nakayama is silent regarding the limitations that the organic EL element is a white emitting element and the microcavity OLED device is configured to have angular-dependent narrow-band emission, and the light integrating element integrates the angular-dependent narrow-band emission from different angles from the microcavity device to form white light emission. She cites Dodabalapur as teaching a white emitting EL device and the OLED device is configured to have angular-dependent narrow-band emission, and the light-integrating element integrates the angular-dependent narrow-band emission from different angles from the microcavity OLED device to form white light emission in order to improve the emissions from the device. She urges that a skilled artisan would have been motivated to modify Nakayama based on Dodabalapur in order to improve emissions from the device.[13]

2. Nakayama and Dodabalapur '416 do not teach the combination of a microcavity OLED device and a light-integrating element as presently claimed.

Claim 1 of appellant's invention specifies a microcavity OLED device and a light-integrating element. The term "integrating" in the context of the present invention is defined in appellant's specification, which clearly sets forth that "any structure that is effective in ***randomly changing*** the direction of light can be used to ***integrate*** the emitted light over angles."[14]

---

[13] Final rejection dated February 7, 2006, at page 3.

The Examiner states that "Nakayama teaches a reflector (2) within the microcavity OLED device. The applicant's specification (US 20050073228) in paragraph 36, states that the light-integrating element may comprise a light reflecting film." The Examiner is correct that Nakayama teaches a reflector 2. It also is true that a light-integrating element may comprise a light reflecting film. However, a light-reflecting film is not ***necessarily*** a light-integrating element, as it would have to be in order to support the examiner's case.

Not all reflectors are light-integrating elements. Indeed, most reflectors are mirrors which reflect light specularly. Specular reflection is the perfect, mirror-like reflection of light from a surface, in which light from a single incoming direction is reflected into a single outgoing direction. Such behavior is described by the law of reflection, which states that the direction of outgoing reflected light and the direction of incoming light make the same angle with respect to the surface normal.

All microcavities must have two spaced mirrors, one of which is reflective and the other of which is semi-transparent, both of which reflect light specularly. Element 2 in Nakayama is one of the mirrors "***within*** the microcavity device," as correctly noted by the examiner, and hence it reflects light specularly, its function in the context of a microcavity device. In Nakayama, it is clear that element 2 is the semi-transparent mirror.[15] Element 2 of Nakayama thus is equivalent to element 30 or 90 of OLED device 10 according to the present invention (depending on whether OLED device 10 is top-emitting or bottom-emitting).[16] Element 2 provides ***no*** integrating function. ***It does not randomly change the direction of light because it is a specular mirror.***

---

[14] Specification at page 8, lines 7-8, emphasis added.

[15] Nakayama, column 5, lines 39-42.

[16] Specification at page 11, lines 24-26.

Appellant's specification makes it quite clear that the light-integrating element must randomly change the direction of light. Integrating elements do not reflect light specularly, but in a broad range of directions. There is no element in Nakayama that corresponds to the light-integrating element recited in appellant's claim 1. The mirrors in microcavity devices, such as mirror element 2 in Nakayama, reflect light specularly. Mirror element 2 of Nakayama therefore would not function to integrate light and serve as a light-integrating element, and the Examiner's position that element 2 in Nakayama is a light-integrating element is not correct. Element 2 does not ***randomly change*** the direction of light. There is nothing in Nakayama that performs this function. Therefore, Nakayama fails to teach a key element of appellant's invention.

Furthermore, claim 1 clearly recites both a microcavity OLED device and a light-integrating element. The examiner is reading one of the sub-elements of the microcavity device of Nakayama on the light-integrating element of appellant's claims. She fails to show that Nakayama shows both a complete microcavity structure ***and*** a separate light-integrating element, as recited in claim 1.

The failure of Nakayama to teach a light-integrating element is not remedied by the disclosure of Dodabalapur '416. Dodabalapur '416 discloses a microcavity structure which internally produces light, and there is no corresponding structure in Dodabalapur '416 to the light-integrating element set forth in claim 1 of present invention. The examiner cites element 14_2 in Figure 6 as being a light-integrating element in Dodabalapur '416. Element 14_2 is the bottom mirror in microcavity device 15_2. Like element 2 of Nakayama, therefore, it corresponds to 30 or 90 of OLED device 10 according to the present invention (depending on whether the OLED device 10 is top-emitting or bottom-emitting).

In summary, the combination of Nakayama and Dodabalapur '416 fails to suggest a combination of a microcavity OLED device and a light-integrating element as recited in claim 1.

3. Neither Nakayama nor Dodabalapur '416 produce white light.

The purpose of the present invention is to provide a white light emitting OLED device as set forth in the preamble of claim 1. Neither Nakayama nor Dodabalapur '416 produce white light.

The examiner admits that Nakayama does not teach a white light emitting OLED device. She cites column 1, line 62 to column 2, line 4, of Dodabalapur '416 as teaching a "white emitting EL device." However, the cited portion of Dodabalapur '416 discloses that microcavity LEDs can "be used to create a ***full color*** display." Indeed, the Dodabalapur '416 refers to devices in which a single emissive layer is used to construct red, green and blue light emitters.[17] A filter layer of appropriate thickness can be incorporated in the microcavity structure to control the emitted wavelength -- "By using different thicknesses for the filter layer in distinct regions of a planar microcavity structure, a single emissive layer of organic material can be used to construct red, green or blue light emitting elements in the distinct regions."[18]

Neither the portion of Dodabalapur '416 cited by the examiner nor any other portion teaches a white light emitting OLED. A person of skill in the art would not interpret a device with red, green and blue pixels as being a white light emitting OLED. Therefore, neither of the cited references suggests "a white light emitting OLED apparatus" as presently claimed.

B. The rejections of claims 4, 11-14 and 23-26 under 35 U.S.C. §103(a) as being unpatentable over Nakayama *et al.* (US Pat. No. 5,847,506) in view of Dodabalapur *et al.* (US Pat. No. 5,814,416) and further in view of Tokito *et al.* (US Pat. No. 5,780,174).

1. The examiner's stated case.

The examiner's position with respect to Nakayama and Dodabalapur '416 is set forth above. The examiner relies upon Tokito as teaching that the material for the semitransparent electrode layer includes Ag or Au, or alloys thereof, and the light-integrating element comprises inclusions dispersed in a matrix wherein the refractive indexes of the inclusions are different from those of the matrix. The examiner takes the position that element 12 of Tokito is a light-integrating element.

---

[17] See, for example, Dodabalapur, column 1, lines 26-28, and column 7, lines 53-61.

[18] Dodabalapur, column 1, lines 57-61.

2. Element 12 of Tokito is not a light-integrating element.

Nakayama and Dodabalapur '416 have been discussed above. Tokito discloses a microcavity structure. Element 12 of Tokito is a multi-layer mirror equivalent to the element 2 of Nakayama or element 14 of Dodabalapur '416 or element 30 or 90 of the present application (depending on whether the device is top-emitting or bottom-emitting). Like element 2 of Nakayama and element 14 of Dodabalapur, element 12 of Tokito is a specular reflector that does not provide a light integrating function. Thus, the addition of Tokito to Nakayama and Dodabalapur '416 does not overcome the failure of these two references to teach a light-integrating element as recited in appellant's claims.

The examiner cites the fact that element 12 of Tokito is made up of a number of thin film layers having different refractive indices as suggesting a light-integrating element that comprises inclusions dispersed in a matrix wherein the refractive indexes of the inclusions are different from those of the matrix. Since element 12 of Tokito is not a light-integrating layer, it can provide no teaching relevant to the composition of a light-integrating element.

C. The rejection of claims 33 and 34 under 35 U.S.C. §103(a) as being unpatentable over Nakayama *et al.* (US Pat. No. 5,847,506) in view of Dodabalapur *et al.* (US Pat. No. 5,814,416) as applied to claim 1 and further in view of Dodabalapur *et al.* (US Pat. No. 5,405,710).

1. The examiner's stated case.

The examiner's position with respect to Nakayama and Dodabalapur '416 is set forth above. The examiner relies upon Dodabalapur '710 as teaching a microcavity device having two or more emitting regions, each one of which is tuned to emit a different emission spectrum and the two or more emitting regions with at least one region having a peak emission wavelength larger than 550 nm and one region having a peak emission wavelength less than 550 nm.

2. Dodabalapur '710 fails to overcome the failure of Nakayama and Dodabalapur '416 to suggest a combination of a microcavity device and an integrating element as recited in all of the claims.

Nakayama and Dodabalapur '416 have been discussed above. Both fail to teach a combination of a microcavity device and a light-integrating element as recited in all of the claims. Dodabalapur '710 also fails to teach this combination. Therefore, there is no *prima facie* case of obviousness of any of the claims based on the Nakayama and Dodabalapur '416 in view of Dodabalapur '710.

VIII. Summary

The examiner cites elements 12 and 14_2 in Nakayama and Dodabalapur '416, respectively, as being light-integrating elements. However, each of these elements is a mirror in a microcavity structure that reflects light specularly and is not a light-integrating element. Thus, neither Nakayama nor Dodabalapur '416 teaches a combination of a microcavity OLED device and a light-integrating element as recited in claim 1. Furthermore, the present claims recite a white light emitting OLED, and neither Nakayama nor Dodabalapur '416 produce white light.

Similar to Nakayama and Dodabalapur, element 12 cited in Tokito as being a light-integrating element is a mirror in a microcavity device and does not function as a light-integrating element. Thus, the addition of Tokito to Nakayama and Dodabalapur '416 does not overcome the failure of these two references to teach a combination of a microcavity OLED device and a light-integrating element as recited in appellant's claims. Moreover, since element 12 of Tokito is not a light-integrating layer, it can provide no teaching relevant to the composition of a light-integrating element.

Dodabalapur '710 also fails to teach a combination of a microcavity OLED and a light-integrating element as presently claimed.

IX. Conclusion

For the above reasons, Appellant respectfully requests that the Board of Patent Appeals and Interferences reverse the rejection by the Examiner and mandate the allowance of Claims 1-34.

Respectfully submitted,

Attorney for Appellants
Registration No. 22,363

Raymond L. Owens/djw
Telephone: 585-477-4653
Facsimile: 585-477-4646

If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.

X. *Appendix I - Claims on Appeal*

1. A white light emitting OLED apparatus comprising a microcavity OLED device and a light-integrating element, wherein the microcavity OLED device has a white light emitting organic EL element and the microcavity OLED device is configured to have angular-dependent narrow-band emission, and the light-integrating element integrates the angular-dependent narrow-band emission from different angles from the microcavity OLED device to form white light emission.

2. The white light emitting OLED apparatus of claim 1 wherein the microcavity OLED device is tuned to have in the normal direction a peak emission wavelength larger than 600 nm or less than 500 nm.

3. The white light emitting OLED apparatus of claim 1 wherein the microcavity OLED device comprises:

a) a substrate having a first surface and a second surface;

b) a metallic bottom electrode disposed over the first surface of the substrate;

c) a metallic top electrode spaced from the metallic bottom electrode;

d) a white light emitting organic EL element disposed between the metallic top electrode and the metallic bottom electrode, wherein one of the metallic electrodes is semitransparent and the other one is substantially opaque and reflective; and

e) wherein the metallic electrodes form a microcavity structure that converts the white light emission into angular-dependent narrow-band light.

4. The white light emitting OLED apparatus of claim 3 wherein material for the semitransparent electrode layer includes Ag or Au, or alloys thereof.

5. The white light emitting OLED apparatus of claim 3 wherein the material for the reflective electrode layer includes Ag, Au, Al, Mg, or Ca, or alloys thereof.

6. The white light emitting OLED apparatus of claim 1 wherein the organic EL element comprises multiple light emitting layers.

7. The white light emitting OLED apparatus of claim 1 wherein the organic EL element has a stacked structure.

8. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element is spaced from the microcavity OLED device.

9. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element is attached to the microcavity OLED device.

10. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element has a light scattering structure.

11. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element comprises inclusions dispersed in a matrix wherein the refractive indexes of the inclusions are different from those of the matrix.

12. The white light emitting OLED apparatus of claim 1 wherein the light-integrating layer elements comprises a plastic matrix loaded with one or more white pigments.

13. The white light emitting OLED apparatus of claim 12 wherein the white pigment is TiO_2.

14. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element comprises a plastic layer having crystalline and amorphous regions having different refractive indexes.

15. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element comprises a plastic layer selected from high density polyethylene, low density polyethylene, ETFE, polystyrene, and polypropylene.

16. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element comprises a surface light scattering structure.

17. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element comprises lens elements.

18. The white light emitting OLED apparatus of claim 1 wherein the light-integrating element comprises a diffusing reflecting element.

19. The white light emitting OLED apparatus of claim 3 wherein the microcavity OLED device includes a total-internal-reflection-frustrating element.

20. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element comprises a light scattering element.

21. The white light emitting OLED apparatus of claim 19 wherein the microcavity OLED device is bottom-emitting and a total-internal-reflection-frustrating element is disposed over the second surface of the substrate.

22. The white light emitting OLED apparatus of claim 19 wherein a total-internal-reflection-frustrating element is disposed close to the semitransparent electrode of the OLED device.

23. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element comprises inclusions dispersed in a matrix wherein the refractive indexes of the inclusions are different from those of the matrix.

24. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element comprises a plastic matrix loaded with one or more white pigments.

25. The white light emitting OLED apparatus of claim 24 wherein the white pigment is TiO_2.

26. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element comprises a plastic layer having crystalline and amorphous regions having different refractive indexes.

27. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element comprises a plastic layer selected from high density polyethylene, low density polyethylene, ETFE, polystyrene, and polypropylene.

28. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element comprises a surface light scattering structure.

29. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element comprises lens elements.

30. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element comprises a diffusing reflecting element.

31. The white light emitting OLED apparatus of claim 19 wherein the total-internal-reflection-frustrating element also serves as the light-integrating element.

32. The white-light emitting OLED apparatus of claim 1 wherein the microcavity OLED device has a monolithically integrated serial connection structure.

33. The white light emitting OLED apparatus of claim 1 wherein the microcavity OLED device has two or more emitting regions each one of which is tuned to emit a different angular-dependent narrow-band emission spectrum.

34. The white light emitting OLED apparatus of claim 1 wherein the microcavity OLED device has two or more emitting regions with at least one region having a peak emission wavelength larger than 550 nm and one region having a peak emission wavelength less than 550 nm.

XI. ***Appendix II - Evidence***

No evidence pursuant to §§1.130, 1.131, or 1.132, or of any other evidence, was submitted during prosecution before the examiner.

XII. ***Appendix III – Related Proceedings***

No appeals or interferences are known which will directly affect or be directly affected by or have bearing on the Board's decision in the pending appeal.